APPENDIX

(1) JP P2003-56386A:

In an injector driving circuit which flows electric current through four (4) injectors, the four (4) injectors are divided into two (2) groups, and the injector driving circuit has two (2) circuits each flows electric current to each group, independently. Further, time interval of fuel injection timing of the two (2) injectors contained in one group is equal to time interval of fuel injection timing of the two (2) injectors contained in the other group.

(2) JP P2001-295685A

Four (4) injectors are driven by a single EDU (injector driving circuit).

/ / / / / / / / / LAST ITEM / / / / / / / /

PATENT ABSTRACTS OF JAPAN

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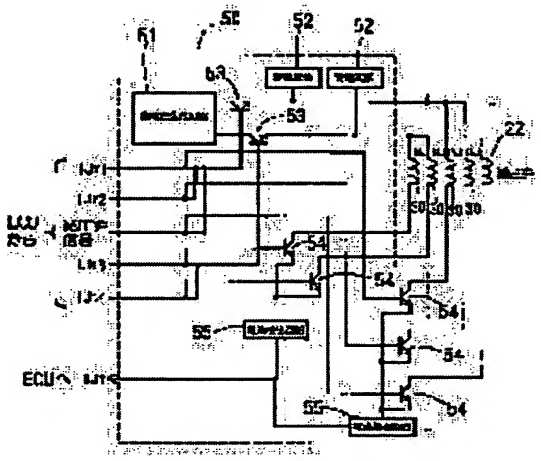
(54) DRIVING DEVICE AND FUEL SUPPLY SYSTEM USING IT

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a small-size driving device and a fuel supply system using it.

SOLUTION: A high-voltage generation circuit 51 of an EDU 50 produces a high voltage to be applied to a solenoid driving part for a pressure reducing valve 22 and that for an injector 30. From the same high-voltage generation circuit 51, a high voltage is applied to the solenoid driving part for the pressure reducing valve 22 and that for the injector 30. Switching elements 53 and 54 are turned on/off according to control signals such as injector driving signals (IJt1, IJt2, IJt3, and IJt4) and a pressure reducing valve signal outputted from an ECU for switching the driving voltage applied to the pressure reducing valve 22 and the injector 30. A current detection circuit 55 detects electric current flowing through the pressure reducing valve 22 and the injector 30 for determining whether overcurrent flows or not and whether there is a break in wiring for the pressure reducing valve 22 and the injector 30. If an abnormal condition is detected by the current detection circuit 55, a failure signal IJf is fed from the EDU 50 to the ECU.



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CLAIMS

[Claim(s)]
[Claim 1] the electromagnetism of a pressure regulating valve which is installed in pressure accumulation tubing which accumulates a fuel, and adjusts the fuel pressure in said pressure accumulation tubing -- the electromagnetism of the injector which injects an actuator and the high voltage fuel supplied from said pressure accumulation tubing -- the driving gear which drives an actuator -- setting -- some [at least] circuits of said driving gear -- the electromagnetism of said injector -- the electromagnetism of an actuator and said pressure regulating valve -- the driving gear characterized by being communalized since an actuator is driven.
[Claim 2] the electromagnetism of said injector -- the electromagnetism of an actuator and said pressure regulating valve -- the driving gear according to claim 1 characterized by the same high-tension generation circuit generating the high tension applied to both actuators.
[Claim 3] the electromagnetism which is installed in a fuel injection pump, pressure accumulation tubing which accumulates the fuel supplied from said fuel injection pump, and said pressure accumulation tubing, and adjusts the fuel pressure in said pressure accumulation tubing -- the pressure regulating valve of an actuation type, and the electromagnetism which injects the high voltage fuel supplied from said pressure accumulation tubing -- the fuel-supply system characterized by having an actuation-type injector and a driving gear according to claim 1 or 2.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] this invention -- the electromagnetism of an injector -- the electromagnetism of the pressure regulating valve currently installed in an actuator and pressure accumulation tubing -- it is related with the fuel-supply system using the driving gear and it which drive an actuator in the circuit where at least a part is common.
[0002]
[Description of the Prior Art] In the fuel system which accumulates the fuel supplied from a fuel injection pump in pressure accumulation tubing, and supplies the pressure-accumulating high voltage fuel to an injector, it is common to install a pressure sensor in pressure accumulation tubing, to detect the fuel pressure in pressure accumulation tubing, and to set the fuel pressure in pressure accumulation tubing as place constant pressure.
[0003]
[Problem(s) to be Solved by the Invention] in order to set the fuel pressure in pressure accumulation tubing as place constant pressure based on the detecting signal of the pressure sensor installed in pressure accumulation tubing -- pressure accumulation tubing -- electromagnetism -- it is possible to install the pressure regulating valve of an actuation type. If the fuel pressure in pressure accumulation tubing exceeds place constant pressure, a pressure regulating valve will be opened, and the fuel pressure in pressure accumulation tubing is reduced by returning a fuel to a fuel tank from pressure accumulation tubing.
[0004] the electromagnetism of a pressure regulating valve -- an actuation circuit is required in order to drive an actuator. moreover, the electromagnetism of an injector -- an actuation circuit is required also in order to drive an actuator. the electromagnetism of an injector -- the electromagnetism of an actuator and a pressure regulating valve -- when an actuator is driven in a separate actuation circuit, the amount of circuits increases and there is a problem that an actuation circuit is enlarged. The object of this invention is to offer the fuel-supply system using a small driving gear and small it.
[0005]
[Means for Solving the Problem] according to the driving gear of this invention according to claim 1 -- some [at least] circuits of a driving gear -- the electromagnetism of an injector -- the electromagnetism of an actuator and a pressure regulating valve -- since an actuator is driven, it is communalized. Therefore, the amount of circuits of a driving gear decreases and a driving gear is miniaturized.
[0006] when the fuel pressure in pressure accumulation tubing becomes high, in order to reduce the fuel pressure in pressure accumulation tubing to high degree of accuracy promptly -- the electromagnetism of a pressure regulating valve -- it is necessary to make into high tension driver voltage which drives an actuator in order to improve the responsibility of an injector -- the electromagnetism of an injector -- it is desirable for the driver voltage applied to an actuator to be also high tension. Usually, high tension generates a high-tension generation circuit in the secondary coil side of a transformer by discharging the energy which charged the electrolytic capacitor and passing a current to the primary-coil side of a transformer. The electrolytic capacitor used for a high-tension generation circuit is large. according to the driving gear of this invention according to claim 2 -- the electromagnetism of an injector -- the electromagnetism of an actuator and said pressure regulating valve -- since the same high-tension generation circuit generates the high tension applied to both actuators, the activity number of a large-sized electrolytic capacitor becomes fewer. Therefore, a driving gear becomes small. Since the small driving gear indicated to claims 1 or 2 is used according to the fuel-supply system of this invention according to claim 3, the loading degree of freedom of the fuel-supply system to a car etc. improves, for example.
[0007]
[Embodiment of the Invention] Hereafter, the example which shows the gestalt of operation of this invention is explained based on drawing. The fuel-supply system by one example of this invention is shown in drawing 2 . The low voltage pump 11 inhales a fuel from a fuel tank 10, and supplies a fuel to the high-pressure fuel injection pump 12. The pressure accumulation tubing 20 accumulates the fuel supplied from a fuel injection pump 12. The pressure sensor 21 and the reducing valve 22 as a pressure regulating valve which adjusts the fuel pressure in the pressure accumulation tubing 20 are installed in the pressure accumulation tubing 20. the electromagnetism in which a reducing valve 22 has a coil (refer to drawing 1) and which is not illustrated -- closing motion actuation is done by the actuator. As for valve opening of a reducing valve 22, the fuel in the pressure accumulation tubing 20 reduces the fuel pressure in return and the pressure accumulation tubing 20 into a fuel tank 10. The pressure accumulation tubing 20 supplies the high voltage fuel accumulated to 1 constant pressure to an injector 30. the electromagnetism in which an injector 30 has a coil (refer to drawing 1) and which is not illustrated -- fuel injection is controlled by the actuator.
[0008] An engine control system (a "engine control system" is hereafter called ECU) 40 inputs a detecting signal from the various sensors 41, and judges an engine operation condition. ECU40 controls the electronic driving gear (an "electronic driving gear" is hereafter called EDU) 50 based on an engine operation condition. EDU50 -- the directions from ECU40 -- being based -- the electromagnetism of a pressure reducing pressure control valve 22 -- the electromagnetism of an actuator and an injector 30 -- driver voltage is applied to an actuator.
[0009] The outline circuitry of EDU50 is shown in drawing 1 . the high-tension generation circuit 51 -- the electromagnetism of a pressure reducing pressure control valve 22 -- the electromagnetism of an actuator and an injector 30 -- the high tension applied to an actuator is generated. the electromagnetism of the same high-tension generation circuit 51 to the pressure reducing pressure control valve 22 -- the electromagnetism of an actuator and an injector 30 -- high tension is applied to an actuator. The constant current source 52 as a holding current generation circuit supplies a current required in order that a pressure reducing pressure control valve 22 and an injector 30 may hold clausilium.
[0010] Switching elements 53 and 54 are turned on and turned off with the injector driving signal (IJt1, IJt2, IJt3, IJt4) and pressure-

reducing-pressure-control-valve signal which are a control signal from ECU40, and switch the driver voltage applied to a pressure reducing pressure control valve 22 and an injector 30. The current detector 55 detects the current which flows a pressure reducing pressure control valve 22 and an injector 30, and judges whether wiring of whether the overcurrent is flowing, the pressure reducing pressure control valve 22, or an injector 30 is disconnected. The current detector's 55 detection of abnormalities sends out IJf which is a fail signal to ECU40 from EDU50.

[0011] The injector driving signal (IJt1, IJt2, IJt3, IJt4) sent out to drawing 3 and drawing 4 by EDU50 from ECU40, a pressure-reducing-pressure-control-valve signal, and the current which flows to a pressure reducing pressure control valve 22 and an injector 30 are shown. In drawing 3 , drawing 4 shows the timing diagram at the time of actuation of a pressure reducing pressure control valve 22 at the time of un-driving [of a pressure reducing pressure control valve 22]. An injector driving signal (IJt1, IJt2, IJt3, IJt4) and a reducing-valve signal are not simultaneously sent out to EDU50 from ECU40. However, either [either / the group from whom an injector driving signal differs, and / IJt1 or IJt2 and] IJt3 or IJt4 may be simultaneously sent out from ECU40. An engine revolution falls suddenly from a high revolution, and a pressure-reducing-pressure-control-valve signal is sent out to EDU50 by asynchronous from ECU40 to lower rapidly the fuel pressure in the pressure accumulation tubing 20. If a reducing valve 22 opens, the fuel in the pressure accumulation tubing 20 will be returned to a fuel tank 10, and the fuel pressure in the pressure accumulation tubing 20 will decline.

[0012] In this example, the same high-tension generation circuit 51 which is a part of actuation circuit of EDU50 is generating the high tension applied to a pressure reducing pressure control valve 22 and an injector 30. Therefore, the amount of circuits of EDU50 becomes less, and EDU50 is miniaturized. Thereby, while being able to reduce a manufacturing cost, the degree of freedom which carries a fuel-supply system in a car improves.

[0013] Moreover, as shown in drawing 1 , the injector driving signal is divided into two groups of IJt1, IJt2, and IJt3 and IJt4. Therefore, even if nonconformities, such as an open circuit or a short circuit, arise in one of the two's group's circuit, a fuel can be injected from an injector 30 in the actuation circuit of the group of another side, and evacuation transit can be performed. Moreover, the amount of circuits can be reduced by making the path of a reducing-valve signal into the path of IJt1 and IJt2 in common.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the typical block diagram showing the fuel-supply system by one example of this invention.
[Drawing 2] It is the outline circuit diagram showing EDU of this example.
[Drawing 3] It is a timing diagram at the time of un-operating [of a pressure regulating valve].
[Drawing 4] It is a timing diagram at the time of actuation of a pressure regulating valve.
[Description of Notations]
10 Fuel Tank
11 Low Voltage Pump
12 Fuel Injection Pump
20 Pressure Accumulation Tubing
21 Pressure Sensor
22 Reducing Valve (Pressure Regulating Valve)
30 Injector
40 ECU
50 EDU (Driving Gear)
51 High-Tension Generation Circuit
52 Constant Current Source (Holding Current Generation Circuit)
53 54 Switching element (switching means)
55 Current Detector

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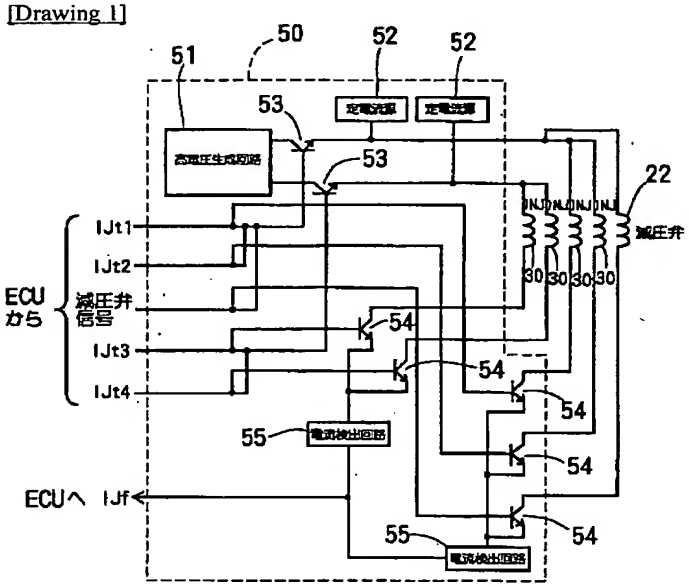
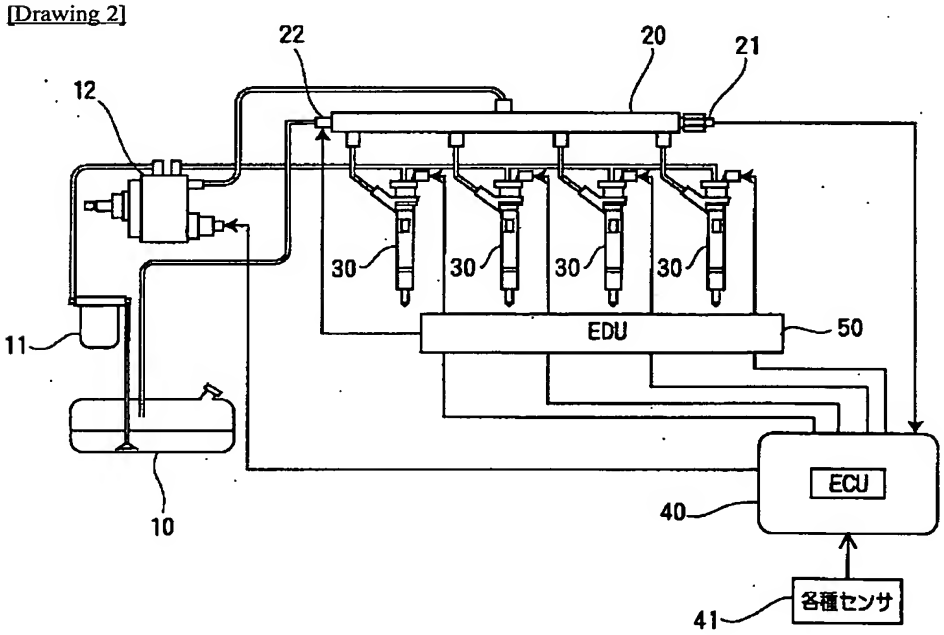
DRAWINGS

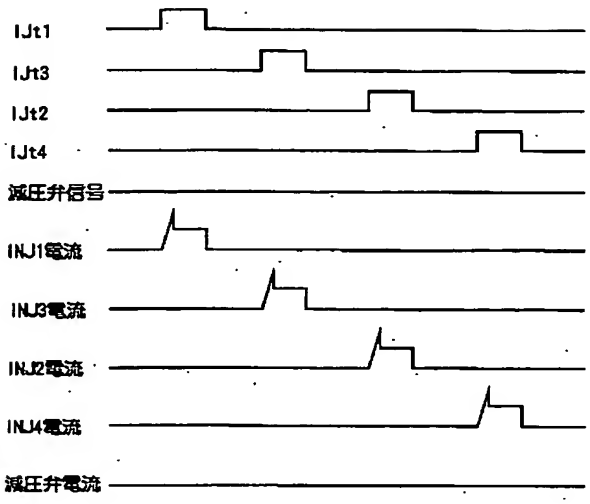
[Drawing 1]



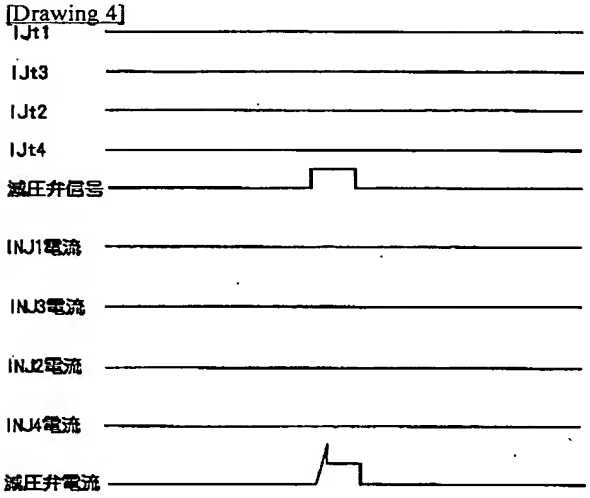
[Drawing 2]



[Drawing 3]



[Drawing 4]



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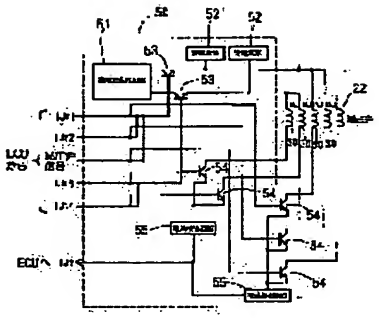

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		３８０			３８０	
		３９５			３９５	
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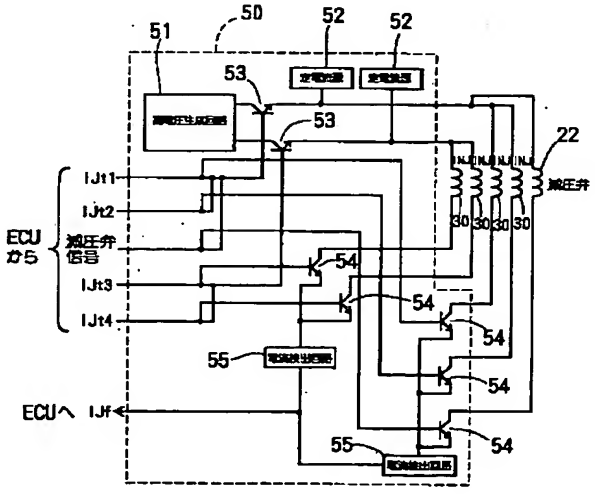
(54)【発明の名称】駆動装置およびそれを用いた燃料供給システム

(57)【要約】

【課題】　小型の駆動装置およびそれを用いた燃料供給システムを提供する。

【解決手段】　ＥＤＵ５０の高電圧生成回路５１は、減圧弁２２の電磁駆動部およびインジェクタ３０の電磁駆動部に加える高電圧を生成する。同じ高電圧生成回路５１から減圧弁２２の電磁駆動部およびインジェクタ３０の電磁駆動部に高電圧を加える。スイッチング素子５３、５４はＥＣＵからの制御信号であるインジェクタ駆動信号（ＩＪｔ１、ＩＪｔ２、ＩＪｔ３、ＩＪｔ４）および減圧弁信号によりオン、オフし、減圧弁２２およびインジェクタ３０に加える駆動電圧をスイッチングする。電流検出回路５５は、減圧弁２２およびインジェクタ３０を流れる電流を検出し、過電流が流れていないか、または減圧弁２２およびインジェクタ３０の配線が断線していないかを判定する。電流検出回路５５が異常を検出すると、ＥＤＵ５０からＥＣＵにフェイル信号であるＩＪｆが送出される。



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【特許請求の範囲】

【請求項１】　燃料を蓄圧する蓄圧管に設置され前記蓄圧管内の燃料圧力を調整する圧力調整弁の電磁駆動部と、前記蓄圧管から供給される高圧燃料を噴射するインジェクタの電磁駆動部とを駆動する駆動装置において、前記駆動装置の少なくとも一部の回路は、前記インジェクタの電磁駆動部および前記圧力調整弁の電磁駆動部を駆動するために共通化されていることを特徴とする駆動装置。

【請求項２】　前記インジェクタの電磁駆動部および前記圧力調整弁の電磁駆動部の両方に加える高電圧を同一の高電圧生成回路が生成することを特徴とする請求項１記載の駆動装置。

【請求項３】　燃料噴射ポンプと、
前記燃料噴射ポンプから供給される燃料を蓄圧する蓄圧管と、
前記蓄圧管に設置され前記蓄圧管内の燃料圧力を調整する電磁駆動式の圧力調整弁と、
前記蓄圧管から供給される高圧燃料を噴射する電磁駆動式のインジェクタと、
請求項１または２記載の駆動装置と、
を備えることを特徴とする燃料供給システム。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、インジェクタの電磁駆動部と蓄圧管に設置している圧力調整弁の電磁駆動部とを少なくとも一部が共通の回路で駆動する駆動装置およびそれを用いた燃料供給システムに関する。

【０００２】

【従来の技術】燃料噴射ポンプから供給される燃料を蓄圧管に蓄圧し、蓄圧した高圧燃料をインジェクタに供給する燃料システムにおいて、蓄圧管に圧力センサを設置して蓄圧管内の燃料圧力を検出し、蓄圧管内の燃料圧力を所定圧に設定することが一般的である。

【０００３】

【発明が解決しようとする課題】蓄圧管に設置した圧力センサの検出信号に基づき蓄圧管内の燃料圧力を所定圧に設定するため、蓄圧管に電磁駆動式の圧力調整弁を設置することが考えられる。蓄圧管内の燃料圧力が所定圧を越えると圧力調整弁を開弁し、蓄圧管から例えば燃料タンクに燃料を戻すことにより蓄圧管内の燃料圧力を低下させる。

【０００４】圧力調整弁の電磁駆動部を駆動するためには駆動回路が必要である。また、インジェクタの電磁駆動部を駆動するためにも駆動回路が必要である。インジェクタの電磁駆動部と圧力調整弁の電磁駆動部とを別々の駆動回路で駆動すると、回路量が多くなり駆動回路が大型化するという問題がある。本発明の目的は、小型の駆動装置およびそれを用いた燃料供給システムを提供することにある。

2

【０００５】

【課題を解決するための手段】本発明の請求項１記載の駆動装置によると、駆動装置の少なくとも一部の回路は、インジェクタの電磁駆動部および圧力調整弁の電磁駆動部を駆動するために共通化されている。したがって、駆動装置の回路量が減少し、駆動装置が小型化する。

【０００６】蓄圧管内の燃料圧力が高くなったときに蓄圧管内の燃料圧力を速やかに、かつ高精度に低下させるために、圧力調整弁の電磁駆動部を駆動する駆動電圧を高電圧にする必要がある。インジェクタの応答性を向上するため、インジェクタの電磁駆動部に加える駆動電圧も高電圧であることが望ましい。通常、高電圧生成回路は、電解コンデンサに充電したエネルギーを放電しトランスの一次コイル側に電流を流すことにより、トランスの２次コイル側に高電圧が発生する。高電圧生成回路に用いられる電解コンデンサは大きい。本発明の請求項２記載の駆動装置によると、インジェクタの電磁駆動部および前記圧力調整弁の電磁駆動部の両方に加える高電圧を同一の高電圧生成回路が生成するので、大型の電解コンデンサの使用個数が減る。したがって、駆動装置が小さくなる。本発明の請求項３記載の燃料供給システムによると、請求項１または２に記載した小型の駆動装置を用いるので、例えば車両等への燃料供給システムの搭載自由度が向上する。

【０００７】

【発明の実施の形態】以下、本発明の実施の形態を示す実施例を図に基づいて説明する。本発明の一実施例による燃料供給システムを図２に示す。低圧ポンプ１１は燃料タンク１０から燃料を吸入し、高圧の燃料噴射ポンプ１２に燃料を供給する。蓄圧管２０は燃料噴射ポンプ１２から供給される燃料を蓄圧する。蓄圧管２０には、圧力センサ２１と、蓄圧管２０内の燃料圧力を調整する圧力調整弁としての減圧弁２２が設置されている。減圧弁２２は、コイル（図１参照）を有する図示しない電磁駆動部により開閉駆動される。減圧弁２２が開弁すると、蓄圧管２０内の燃料が燃料タンク１０に戻り、蓄圧管２０内の燃料圧力が低下する。蓄圧管２０は一定圧に蓄圧した高圧燃料をインジェクタ３０に供給する。インジェクタ３０は、コイル（図１参照）を有する図示しない電磁駆動部により、燃料噴射を制御される。

【０００８】エンジン制御装置（以下、「エンジン制御装置」をＥＣＵという）４０は、各種センサ４１から検出信号を入力し、エンジン運転状態を判定する。ＥＣＵ４０はエンジン運転状態に基づき電子駆動装置（以下、「電子駆動装置」をＥＤＵという）５０を制御する。ＥＤＵ５０は、ＥＣＵ４０からの指示に基づき減圧弁２２の電磁駆動部およびインジェクタ３０の電磁駆動部に駆動電圧を加える。

【０００９】図１にＥＤＵ５０の概略回路構成を示す。

高電圧生成回路５１は、減圧弁２２の電磁駆動部およびインジェクタ３０の電磁駆動部に加える高電圧を生成する。同じ高電圧生成回路５１から減圧弁２２の電磁駆動部およびインジェクタ３０の電磁駆動部に高電圧を加える。保持電流生成回路としての定電流源５２は、減圧弁２２およびインジェクタ３０が閉弁を保持するために必要な電流を供給する。

【００１０】スイッチング素子５３、５４はＥＣＵ４０からの制御信号であるインジェクタ駆動信号（ＩＪｔ１、ＩＪｔ２、ＩＪｔ３、ＩＪｔ４）および減圧弁信号によりオン、オフし、減圧弁２２およびインジェクタ３０に加える駆動電圧をスイッチングする。電流検出回路５５は、減圧弁２２およびインジェクタ３０を流れる電流を検出し、過電流が流れていないか、または減圧弁２２およびインジェクタ３０の配線が断線していないかを判定する。電流検出回路５５が異常を検出すると、ＥＤＵ５０からＥＣＵ４０にフェイル信号であるＩＪｆが送出される。

【００１１】図３および図４にＥＣＵ４０からＥＤＵ５０に送出されるインジェクタ駆動信号（ＩＪｔ１、ＩＪｔ２、ＩＪｔ３、ＩＪｔ４）と減圧弁信号、ならびに減圧弁２２とインジェクタ３０に流れる電流を示す。図３は減圧弁２２の非駆動時、図４は減圧弁２２の駆動時のタイムチャートを示す。ＥＣＵ４０からＥＤＵ５０に同時にインジェクタ駆動信号（ＩＪｔ１、ＩＪｔ２、ＩＪｔ３、ＩＪｔ４）と減圧弁信号が送出されることはない。ただし、インジェクタ駆動信号が異なるグループ、ＩＪｔ１またはＩＪｔ２のいずれか一方と、ＩＪｔ３またはＩＪｔ４のいずれか一方とが同時にＥＣＵ４０から送出されることはある。減圧弁信号は、エンジン回転が高回転から急に下がり、蓄圧管２０内の燃料圧力を急激に下げたい場合にＥＣＵ４０からＥＤＵ５０に非同期に送出される。減圧弁２２が開弁すると、蓄圧管２０内の燃料が燃料タンク１０に戻され、蓄圧管２０内の燃料圧力が低下する。

【００１２】本実施例では、ＥＤＵ５０の駆動回路の一部である同一の高電圧生成回路５１が、減圧弁２２およびインジェクタ３０に加える高電圧を生成している。したがって、ＥＤＵ５０の回路量が減り、ＥＤＵ５０が小型化する。これにより、製造コストが低減できるとともに、車両に燃料供給システムを搭載する自由度が向上する。

【００１３】また図１に示すように、インジェクタ駆動信号は、ＩＪｔ１とＩＪｔ２、ならびにＩＪｔ３とＩＪｔ４の２グループに分けられている。したがって、片方のグループの回路に断線または短絡等の不具合が生じても、他方のグループの駆動回路でインジェクタ３０から燃料を噴射し、退避走行を行うことができる。また、減圧弁信号の経路をＩＪｔ１およびＩＪｔ２の経路と共通にすることにより、回路量を減らすことができる。

【図面の簡単な説明】

【図１】本発明の一実施例による燃料供給システムを示す模式的構成図である。

【図２】本実施例のＥＤＵを示す概略回路図である。

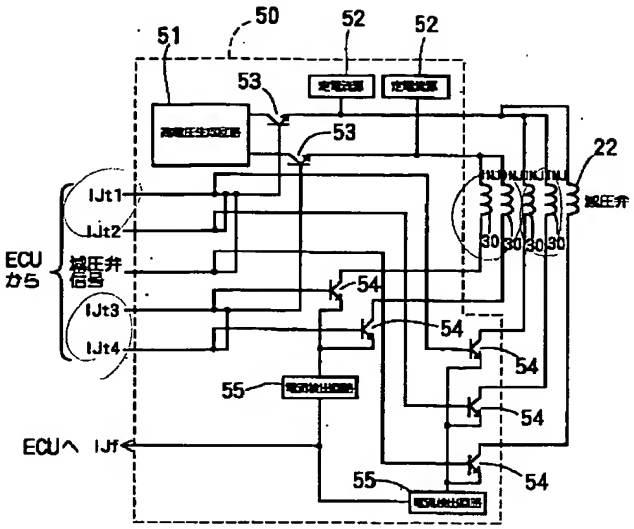
【図３】圧力調整弁の非作動時のタイムチャートである。

【図４】圧力調整弁の作動時のタイムチャートである。

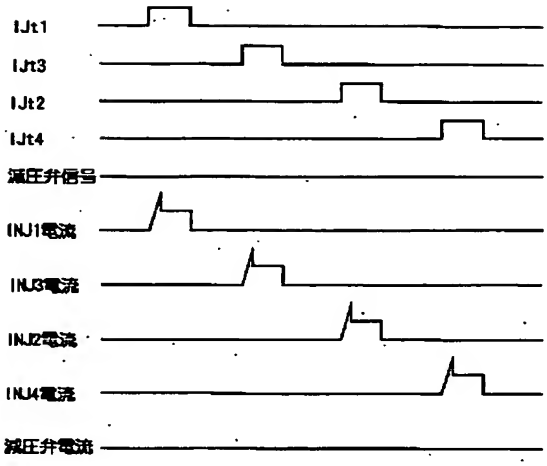
【符号の説明】

１０　燃料タンク
１１　低圧ポンプ
１２　燃料噴射ポンプ
２０　蓄圧管
２１　圧力センサ
２２　減圧弁（圧力調整弁）
３０　インジェクタ
４０　ＥＣＵ
５０　ＥＤＵ（駆動装置）
５１　高電圧生成回路
５２　定電流源（保持電流生成回路）
５３、５４　スイッチング素子（スイッチング手段）
５５　電流検出回路

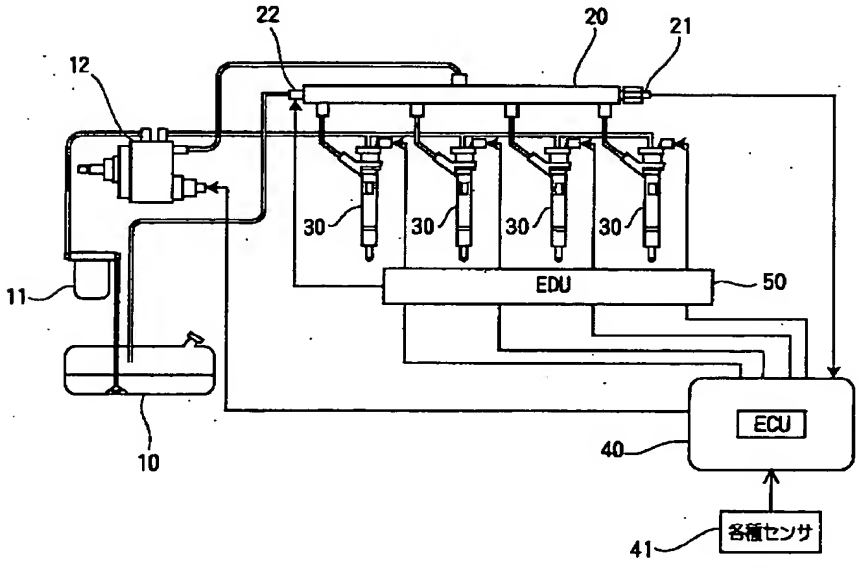
【図１】


50
51
52
52
53
53
22
IJt1
IJt2
減圧弁信号
IJt3
IJt4
ECUから
30
30
30
30
54
54
54
54
55
55
ECUへ IJt

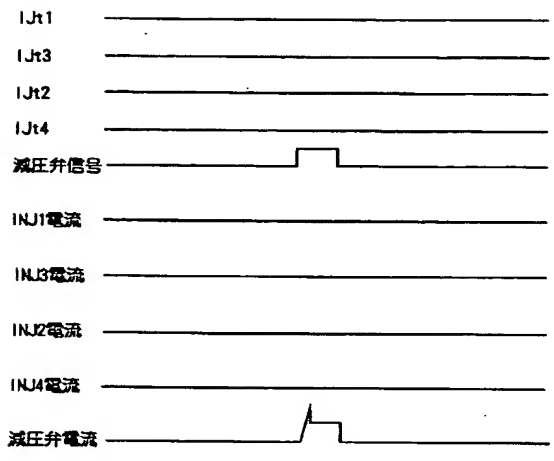
【図３】


IJt1
IJt3
IJt2
IJt4
減圧弁信号
INJ1電流
INJ3電流
INJ2電流
INJ4電流
減圧弁電流

【図２】


22
20
21
12
30
30
30
30
EDU
50
11
10
ECU
40
41
各種センサ

【図４】



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		３５０			３５０Ｅ
					３５０Ｐ
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